October 2023

Human Nature Projects Ontario Newsletter

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INTRODUCTION

The oceans of our planet are a constantly changing and intricate ecosystem that are essential to maintaining life on Earth. However, ocean acidification, a major issue, weighs over our oceans. Rising carbon dioxide (CO2) emissions are having a substantial impact on seawater chemistry in nations all over the world. Many nations will experience food and economic insecurity as acidification progresses, as well as a reduction in coastal hurricane protection and revenue from tourism. Communities that depend on fish and shellfish or depend on coral reefs for protection are particularly at risk (The Commonwealth, n.d.). Small island developing states are particularly at risk.

"The non-stop emission of greenhouse gases into the atmosphere is bound to lead to enormous alterations to land ecosystems and will hit marine species used for food and have knock-on effects on coastal communities, especially in developing countries," said Richard A. Feely, a senior scientist at the Pacific Marine Environmental Laboratory, in Seattle at the U.N. climate talks.

GEOGRAPHICAL IMPACTS

The socioeconomic effects of climatic occurrences inland have been extensively studied with climate change, but the impact of what is occurring offshore has gotten little consideration (Teveras & Armand, 2021). The ocean is changing as a result of CO2 emissions from humans. In addition, the ocean's oxygen concentration has significantly dropped and worldwide sea surface temperatures have increased. Fish supplies have been steadily declining over the past few decades as a result of climate change, industrialized and habitat-destructive fishing, pollution, and coastal urbanization (Golden et al. 2016, Bayramoglu et al. 2019). Toferry Primanda, an Indonesian delegation spokesperson told the Thomson Reuters Foundation in Warsaw that numerous reefs and fish species are perishing throughout the Indian Ocean as a result of warming waters and acidification (Shaikh & Tunio, 2013). Numerous commercially significant fish species that rely on the services provided by reefs will also be in jeopardy when they disappear. By the end of this century, scientists predict a huge global extinction of corals if nations do not significantly reduce their emissions (Oceana, 2009). Food and long-term economic security are at jeopardy, as well as commercial fishing and tourism. Coral reef ecosystems alone are predicted to cost countries $1 trillion in economic losses (The Commonwealth, n.d.). Understanding the effects of human activities on the ocean is essential for ensuring global food security because more than three billion people rely on marine biodiversity as a primary source of food (Sala et al. 2021).

Figure 1. Erosion on Coral Reefs (Smithsonian Magazine, 2019)

IMPACTS OF OCEAN ACIDIFICATION ON COUNTRIES

IMPACTS ON NATIONS

“People who rely on the ocean's ecosystem services – often in developing countries – are especially vulnerable. And coastal communities in Asia-Pacific and South Asian coastal communities are no exception,” said Jorge Luis Valdés, head of Ocean Sciences at the Intergovernmental Oceanographic Commission of UNESCO.

Both coral reefs and shellfish, which are significant food sources, will be severely impacted by increased acidity levels, which are expected to stop all new coral reef growth by the end of the century (Shaikh & Tunio, 2013). Poor coastal communities will be hardest hit by this change, especially those in small island states where fishing and coral reefs are vital to survival.

“Poor communities are highly reliant on sea resources for their food and livelihood needs but have limited options to mitigate effects if their current lifestyles become not sustainable due to what is called ocean acidification,” said Carol Turley, a senior scientist at Plymouth Marine Laboratory in the United States at a side event at the climate negotiations.

According to the ministry's report, fishing supports 2.5 million jobs directly and nearly 914,000 indirectly. Rachmat Witoelar, the Indonesian presidential special envoy for climate change, warned that the country's demand for fish may exceed the nation's availability and that up to 40% of fishermen may lose their sources of income. Given how strongly their populations rely on fish for sustenance, this is especially important for low- and middle-income nations (Teveras & Armand, 2021). Fish accounts for 17% of all dietary animal proteins worldwide. This number averages 26% in low- and middle-income countries, reaching 50% or higher in Southeast Asia and tiny island developing nations.

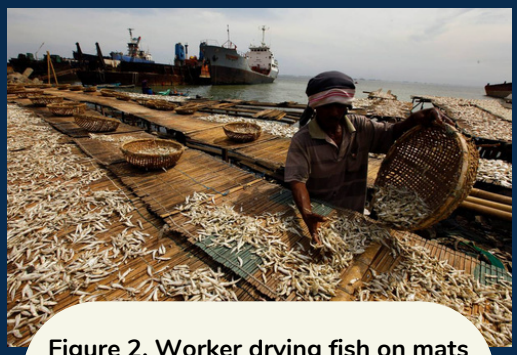

Figure 2. Worker drying fish on mats (The Thomson Reuters Foundation News, 2013)

CONCLUSION

Ocean acidification is a worldwide problem with profound impacts on nations all over the planet. Future economy and the fishing industry are expected to suffer greatly from ocean acidification, according to many estimates. However, it has already had a noticeable and demonstrable impact on socioeconomic progress. The United Nations (2019) emphasizes the need to "conserve and sustainably use the oceans, seas, and marine resources for sustainable development" (Sustainable Development Goal 14), (Teveras & Armand, 2021). Only by working together can we possibly hope to safeguard the priceless resource that is our planet's oceans and guarantee a sustainable future for all countries.

OCTOBER EVENTS!

The Human Nature Projects (HNP) Ontario team is pleased to announce our 2 more exciting IN-PERSON events!

Our Very FIRST Tree Planing Event!

Help us clean the air and create mire natural habitation!

Time & Location: Saturday, October 14th from 10:00AM-1:30PM EST, at Chris Gibson Park (McLaughlin Rd Brampton, ON L6X 1Y9)

Eligibility Criteria: Open to participants of all ages but only 50 spots!

Up to 5 volunteer hours will be granted for involvement in the community. Sign up NOW!

Bring a physical copy of the volunteer hours sign-off sheet

Hosted in collaboration with Credit Valley Conservation (CVC)

Credit Valley Conservation

@cvc_ca

Community Cleanup!

Let's go on an interactive hike around Lake Ontario while cleaning up nature!

Time & Location: Saturday, October 21st from 10:00AM-1:00PM EST, at Rouge Park/Beach (195 Rouge Hills Dr, Scarborough, ON)

Eligibility Criteria: Open to participants of all ages, but only 60 spots!

5-6 volunteer hours will be granted for involvement in the community. Sign up NOW!

Bring a physical copy of the volunteer hours sign-off sheet

@ecospark_env

Hosted in collaboration with EcoSpark!

DECLINE OF DIATOMS DUE TO OCEAN ACIDIFICATION

INTRODUCTION

Diatoms, a type of algae, serve as a keystone species of the marine ecosystem. As producers, they serve as the foundation to the oceanic food web, feeding plankton, fish and more. These organisms are typically unicellular or colonial, and they thrive in environments that are rich with carbon dioxide, outcompeting other types of algae such as seaweed. Their incredible ability to sequester atmospheric CO2 makes them vital carbon sinks in a world with devastatingly high levels of greenhouse gases. Annually, they are able to remove 10 to 20 billion metric tons of inorganic carbon from the atmosphere to produce organic compounds (Karlusich et al., 2021). They aid in the transport of carbon dioxide to deep sea waters, which helps regulate the climate (Helmholtz Centre for Ocean Research Kiel (GEOMAR), 2022). The increased global temperatures has resulted in a phenomenon known as ocean acidification, as dissolved CO2 raises seawater pH levels, harming thousands of marine species as a result. Diatoms were previously thought to be unaffected due to their unique structure, but evidence points to their declining population.

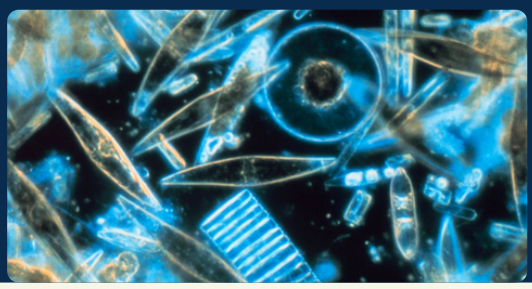

Figure 1. Assorted Diatoms through a microscope (Taylor, 1983)

STRUCTURE

A diatom's defining feature is their inorganic cell wall, made from silica, a compound consisting of silicon and oxygen. This glass-like shell is also referred to as a frustule, and often creates intricate patterns in a circular or elongated shape (The Editors of Encyclopaedia Britannica, 2023). Since ocean acidification mainly affects calcifying organisms, diatoms were thought to be resistant to the rising pH levels. Organisms such as molluscs and urchins rely on calcium carbonate to construct their shells, and that ability is limited by increased ocean acidity, but silica had no such weakness. Yet research from the GEOMAR Helmholtz Centre for Ocean Research Kiel and other institutions present new findings which threaten the wellbeing of diatom populations (2022). Ocean acidification results in a decreased rate of dissolution for the silica shells, which causes them to sink to deeper layers of water before being chemically dissolved. Thus, the compound is not accessible to other diatoms near the surface level, despite the need for a supply of silicon to build their shells. As a result, the diatom population is at risk of decreasing by as much as 10% by the end of the twenty-first century, which could have catastrophic impacts on the ecosystem (Helmholtz Centre for Ocean Research Kiel (GEOMAR), 2022).

DECLINE OF DIATOMS DUE TO OCEAN ACIDIFICATION

IMPACTS OF DECLINING POPULATION

Not only are diatoms an important food source for a variety of marine life, but they also regulate the carbon cycle. These autotrophic organisms use sunlight to photosynthesize, which allows them to fixate dissolved carbon dioxide in the water to form organic compounds, releasing oxygen as a byproduct. It is one of the main aquatic producers that allow the ocean to be known as a carbon sink. Additionally, it accounts for over 40% of marine biomass, and is staple in the diets of snails and other small fish (Harvey et al., 2019). Even their fossilized remains are beneficial for industrial use. Diatomaceous earth, a powder made from a combination of sediment and diatom shells, can be used to improve one's health due to its high silica content. It also serves as a filter to remove unwanted materials in drinking water, an insecticide, a type of insulation, and even as a base in dynamite (WebMD, n.d.).

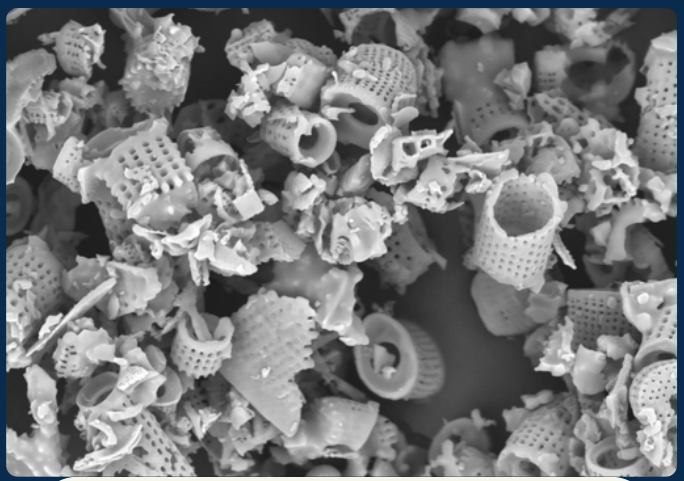

Figure 2. Diatomaceous Earth under an electron microscope (Siodłak, 2015)

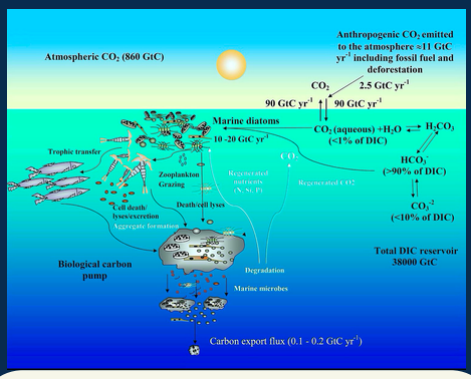

Figure 3. Diatoms and the carbon cycle (Karlusich et al., 2021)

PREVENTION

Humanity's irresponsibility and disregard for the environment has accelerated global warming to a point where it is impossible for nature to recover on its own. Diatoms play a vital role in the marine ecosystem, climate regulation, and human industry. Studies show that if humanity's current destructive behaviour continues, the decrease in population may not be limited to 10%. In fact, increasing greenhouse gas emissions may result in losses of up to 26% by 2200, which is over a quarter of the current population (Helmholtz Centre for Ocean Research Kiel (GEOMAR), 2022). It was wrongful to assume that they experienced no effects of ocean acidification, simply because it is not a calcifying organism. The biosphere continues to prove that if climate change continues, all of Earth's unique flora and fauna are in grave danger.

EXECUTIVE OF THE MONTH

Hello everyone, I'm Sherry Sun! Here's a bit about me and my time here at HNP!

1. What do you enjoy most about being on the HNP team?
The people! Everyone at HNP is so so talented and I've made so many friends since I joined the team. Love you guys 🫶

2. Tell us more about the recent task you've been working on.
The marketing team is currently working on the October 2023 clean up event posts to be posted! Stay tuned and make sure to like and comment when they come out 🙂

3. Tell us more about the significant role you play in being a part of the executive team.
As a marketing co-director, I'm in charge of delegating marketing tasks to associates as well as guiding them whenever needed. I also design plenty of posts myself!

4. What is something you learned while being a part of the HNP team?
HNP team is the biggest team I've been in, in terms of the number of execs, so I guess the most valuable thing I learned is how critical communication is. Even if one person isn't communicating properly, due to the large scale of the team the butterfly effect causes so many things to fall behind. So please give your directors or VP updates regularly guys 😝

5. What is your most memorable experience with HNP?
It's so hard to rank them, but I'll go with the April clean up event at Centennial Park! It was the first in-person HNP event I participated in after I became an exec, and I really enjoyed taking photos for the Instagram stories and hosting live streams with my new exec friends 🙂 Also there was pizza. Pizza was just it for me. 🍕

6. How does it feel to be a member of the HNP team?
Appreciated, heard, welcome. HNP has a surprisingly supportive environment for an organization as big as it is. Although we're always hustling, there is always someone looking out for you, whether it be leadership or your peers. That's also another part of HNP that I really love 🙂

SOCIAL MEDIA

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